DESCRIPTION AMENDMENTS

Rewrite the paragraph beginning on page 1, line 4, to read as follows:

BACKGROUND OF THE INVENTION

~~Invention~~ The invention relates to a gas supply arrangement of a marine vessel ~~according to preamble of claim 1~~ and to ~~method~~ a method of controlling gas pressure in a gas supply arrangement of a marine vessel ~~according to the preamble of claim 8~~.

Rewrite the paragraph beginning on page 3, line 6, to read as follows:

~~Particularly in gas operated vessel having gas engines one must pay attention to the fact that although natural gas is primarily composed of methane, it may also contain ethane, propane and heavier hydrocarbons. Small quantities of nitrogen, oxygen, carbon dioxide, sulphur compounds, and water may also be found in natural gas. The liquefying process requires the removal of some of the components such as water and carbon dioxide from the produced natural gas. In ideal situation it would be beneficial to have only methane remained because it burns efficiently substantially without producing any harmful byproducts. When considering the circumstance in the cargo tanks of an LNG vessel it is evident that the natural boil-off gas contains at least nitrogen in addition to methane due to their boiling point differences and the circumstances in the tanks. The presence of nitrogen is decreasing the performance of an engine and if the nitrogen content of the gas exceeds a certain level (say 22 %) the prime mover might have to be derated. So, it is desirable to minimise the amount of nitrogen in the gas.~~

Rewrite the paragraph beginning on page 3, line 21, to read as follows:

An objective of the invention is to provide a gas supply arrangement for a marine vessel, which ~~solves the above mentioned and other problems of the prior art. It is also an objective of the invention to provide a method of controlling gas pressure in a gas supply arrangement for a marine vessel with liquefied gas cargo tank, which~~ provides even pressure at the feed line and reliable gas supply for consumption devices of the vessel.

Rewrite the paragraph beginning on page 3, line 28, to read as follows:

SUMMARY OF THE INVENTION

~~Objectives of the invention are met substantially as is disclosed in claims 1 and 8, and in more detailed manner in other claims.~~ In the following the invention will be described with a reference mainly to one cargo tank. However, it is clear that a marine vessel may be provided with several cargo tanks each having an individual gas supply arrangement or several cargo tanks may be connected parallel having a shared gas supply arrangement.

Rewrite the paragraph beginning on page 4, line 4 to read as follows:

Gas supply arrangement of a marine vessel being adapted to carry liquefied gas in its cargo tank having an ullage space section and a liquid phase section, which arrangement utilises the gas as fuel to provide power for the vessel, the arrangement comprising

- a first gas supply line provided for processing the natural boil-off gas formed in the cargo tank.
- a second gas supply line which connects the cargo tank and the gas main supply line and which is provided with at least a pump for raising the pressure of the liquid gas and for pumping it forward. The second gas supply line is provided with a gas reservoir having an ullage space section and liquid phase section, and the arrangement is provided with a first duct section of the second gas supply line connecting the liquid phase section of the cargo tank and the liquid phase section of the gas reservoir, and being provided with the ~~pump, and further the arrangement is provided with a return line connecting the liquid phase section of the reservoir and the cargo tank being provided with a control valve for controllably returning liquid gas back into the cargo tank. This makes it possible to control and maintain desired temperature in the reservoir and thus accomplish separation of heavier hydrocarbons from the gas fed forward from the reservoir to the consumption device. As a result, the methane concentration in the gas is increased which is beneficial for gas engine operation.~~ pump.

Rewrite the paragraph beginning on page 4, line 25, to read as follows:

The first gas supply line according to an embodiment of the invention connects an ullage space section of the cargo tank and a gas main supply line and which is provided with a compressor for controlling the pressure in the liquefied gas storage tank and in the gas main supply line. However, in some application the processing of natural boil-off gas may comprise a gas re-liquefying apparatus and return ~~channel back to~~ line connecting the liquid phase section of the reservoir and the cargo tank and provided with a control valve for controllably returning liquid gas back into the cargo tank.

Rewrite the paragraph beginning on page 5, line 12, to read as follows:

~~The reservoir is provided with combined temperature/pressure control unit by means of which gas may be evaporated from the liquid phase section of the reservoir. The combined temperature/pressure control unit of the reservoir comprises a second heat transfer device for applying heat to the liquid phase gas in the reservoir. The second heat transfer device is provided with control device responsive to the gas pressure in the reservoir. The reservoir is provided with surface level control arrangement for controlling the surface level of the liquid phase section.~~

Rewrite the paragraph beginning on page 5, line 20, to read as follows:

Method of providing gas in a gas supply arrangement of a marine vessel with liquefied gas tank having an ullage space section and liquid phase section, and a gas consumption device, in which gas from the tank is led to the consumption device via a gas supply line, the gas supply line being provided with a pump for raising the pressure of the liquid gas and pumping it forward. The gas supply line gas is fed into a reservoir having an ullage space section and liquid phase ~~section, in which reservoir the gas is temporarily stored and from which gas is introduced to the gas consumption device, and that the temperature in the reservoir is maintained at desired level so that evaporation of desired known component or components of the gas occur and that at least a part of non-evaporated liquid gas is returned to~~

~~the tank. This way the methane concentration of the gas evaporated in the reservoir be increased.~~ section.

Rewrite the paragraph beginning on page 6, line 1, to read as follows:

~~The pressure of the gas in the in the gas supply line is controlled by controlling the temperature of the liquid phase section of the reservoir.~~

Rewrite the paragraph beginning on page 6, line 5, to read as follows:

~~The invention has several advantages. First of all, the pressure control is very accurate due to the novel way of controlling the pressure by heating the liquid gas. With the invention it is also possible to provide more suitable gas for gas engine operation by separating the heavy hydrocarbons from the gas. Additionally the invention provides a buffer for gas fuel for the consumption devices in case the connection to the cargo tank must be cut off.~~

Rewrite the paragraph beginning on page 6, line 12, to read as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention will be described with the reference to the accompanying schematic drawing, in which figure 1 shows an exemplary preferred of the gas supply arrangement according to the invention.

Rewrite the paragraph beginning on page 6, line 16, to read as follows:

DETAIL DESCRIPTION

Figure 1 depicts schematically cross section of a marine vessel 6, like LNG tanker. The vessel 6 is adapted to carry liquefied gas in its cargo tanks 4. Normally there are several tanks in LNG tanker, but in the ~~figure 1~~ figure only one tank 4 is shown for clarity reasons. The cargo tank 4 is filled so that there is always an ullage space section 4.1 filled with gas in gaseous form and a liquid phase section 4.2 filled with liquefied gas. During the storing of the liquefied gas the gas is evaporating changing its phase and transferring to the

ullage ~~space 4.1 section~~ space section 4.1. The evaporated gas, so called natural boil-off gas, may be utilised in a consumption device 5 of the vessel 6. The consumption device 5 is preferably a gas engine providing propulsion power. In the ~~figure 1 there is~~ figure only one consumption device 5 is shown but it is clear that there may be several devices.

Rewrite the paragraph beginning on page 6, line 28, to read as follows:

In this embodiment the vessel 6 is provided with a gas supply arrangement 1, which comprises a first gas supply line 2 and a second gas supply line 3. The first gas supply line 2 extends from ~~an ullage~~ the ullage space section 4.1 of the cargo tank 4 to a gas main supply line 7 leading gas to the consumption device 5. The first gas supply line 2 is adapted for delivering the evaporated boil-off gas from the cargo tank 4 to the consumption device 5 of the vessel 6 via ~~a main~~ the main supply line 7. The cargo tank 4 is maintained slightly over-pressurised. The first gas supply line 2 is provided with a compressor 2.1 for maintaining the pressure in the cargo tank 4 at desired level and for raising the pressure of the boil-off gas to an adequate level for usage in the consumption device 5. The pressure level in the gas main supply line 7 must be maintained at appropriate pressure but below maximum design limits. The lower limit is typically ruled by requirements of the ~~gas engines of the vessel being as the~~ consumption device 5. The capacity of the compressor 2.1 is controlled by making use of pressure measurement device 10 provided in the cargo tank ullage space, so that the pressure in the cargo tank remains within certain design limits. The operation of the compressor 2.1 is also depending on the pressure in the gas main supply line 7. The gas main supply line 7 is therefore provided with another pressure measurement device 10.1, which transmits pressure value to be used in control procedure of the compressor 2.1. Until the pressure in the gas main supply line 7 has not reached its upper limit the compressor is maintained in operation. The compressor may be provided for example with an inlet vane control, which allows certain variation in the capacity. In case the pressure in the gas main supply line (measured by the device 10.1) is decreasing and simultaneously the pressure in

the cargo tank is measured by the device 10 to be too low, an alternate way of producing gaseous gas must be provided.

Rewrite the paragraph beginning on page 9, line 9, to read as follows:

The heating of the liquid gas in the liquid phase section 3.7 is accomplished by a ~~second~~ heat transfer device. The ~~second~~ heat transfer device according to a preferred embodiment of the invention comprises an external heat exchanger 3.9 into and from which the liquefied gas is flowing through ~~piping 3.10~~ piping 3.11. The liquefied gas is heated and/or at least partly evaporated by a heat transfer ~~medium, like glycol-water mixture,~~ medium flowing in the other side 3.8 of the heat exchanger 3.9. There may be a circulation pump (not shown) for facilitating the flowing of the liquefied gas, but the piping may be so dimensioned that free circulation based on density difference will occur. Heat transfer and thus heating and evaporation of the liquefied gas is controlled partly by a valve 9.1, which controls the flow of the liquid gas into the heat exchanger 3.9. The heat transfer medium may be e.g. glycol-water mixture or steam, but practically any suitable heat source, also electric heater, may be utilised.

Rewrite the previously amended paragraph beginning on page 11, line 4, to read as follows:

The reservoir 3.2 is also provided with a return pipe 3.14, which leads from the liquid phase section of the reservoir back to the cargo tank 4. The return pipe 3.14 is provided with a valve 3.15 for controlling the flow of liquid gas. The valve 3.15 is responsive to the temperature in the reservoir 3.2, which is measure by a temperature measurement device 11 provided in connection with the gas reservoir 3.2. In case the temperature is too high the valve 3.15 is opened and the gas from the liquid phase section of the reservoir 3.2 will flow back to the cargo tank 4. The return flow will be compensated, when necessary, by feed from the cargo tank through the first duct section 3.4. Since the temperature in the cargo tank is about minus 163(C the liquid fed to the reservoir 3.2 will lower the temperature in the reservoir. In order to preheat the liquid gas fed to the reservoir and cool the returned portion of the ~~gas. The~~ gas,

the flows are in heat transfer relation with each other by a ~~first~~ heat exchanger device 3.16.

Particularly in a gas operated vessel having gas engines one must pay attention to the fact that although natural gas is primarily composed of methane, it may also contain ethane, propane and heavier hydrocarbons. Small quantities of nitrogen, oxygen, carbon dioxide, sulphur compounds, and water may also be found in natural gas. The liquefying process requires the removal of some of the components such as water and carbon dioxide from the produced natural gas. In ideal situation it would be beneficial to have only methane remain because it burns efficiently substantially without producing any harmful byproducts. When considering the circumstance in the cargo tanks of an LNG vessel it is evident that the natural boil-off gas contains at least nitrogen in addition to methane due to their boiling point differences and the circumstances in the tanks. The presence of nitrogen decreases the performance of an engine and if the nitrogen content of the gas exceeds a certain level (say 22 %) the prime mover might have to be derated. So, it is desirable to minimise the amount of nitrogen in the gas.

By maintaining proper temperature, preferably about minus 100° C in the reservoir 3.2 ~~as described above~~ it is possible to facilitate separation of compounds contained in the gas, so that evaporation of desired known component or components of the gas occur and some part of the gas is returned to the cargo tank 4. Particularly heavier hydrocarbons may be separated from the gas so that the percentage of methane in the gas fed forward from the reservoir 3.2 is ~~increased.~~ increased, which is beneficial for gas engine operation. This arrangement is beneficial for the operation of the gas engines as the consumption device 5.

Rewrite the paragraph beginning on page 12, line 11, to read as follows:

Control dependencies in the ~~figure 1 is~~ figure are shown informally by dotted lines for clarity reasons. However, it is clear that the control system may be realised by various manners, using centralised or distributed control arrangements.